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PROGRESS REPORT

NO. 8

DEVELOPMENT OF

IMPROVED BLOWOUT PREVENTION PROCEDURES

TO BE USED IN DEEP WATER DRILLING OPERATIONS

Submitted To

THE UNITED STATES GEOLOGICAL SURVEY

Department of the Interior

Reston, Virginia

PETROLEUM ENGINEERING DEPARTMENT

Louisiana State University

Baton Rouge, Louisiana 70803

February 16, 1981

PROGRESS REPORT

November 16, 1980 - February 15, 1981

Development of Improved Blowout Prevention Procedures for Deep Water Drilling Operations

Contract No. 14-08-0001-17225, Mod. 2
Effective Date: August 23, 1978
Expiration Date: August 31, 1982
Funded Amount - $630,789.00

Sponsored by

The United States Geological Survey

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Principal Investigators:

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Petroleum Engineering Department

A. T. Bourgoyne, Professor and Chairman
Petroleum Engineering Department

February 16, 1981

RESEARCH OBJECTIVES

The primary objectives of the proposed research are the development of improved blowout prevention procedures to be used in deep water, floating drilling operations. The overall research plan was divided into eight tasks which would take approximately four years for completion. The project funding received under the present contract is $630,789 to perform the following tasks:

Task Description

1. Design of well for accurately modeling blowout control operations on a floating drilling vessel in deep water.
   a. Well scaling and design.
   b. Preparation of bids and specifications.
2. Construction of well for accurately modeling blowout control operations on a floating drilling vessel in deep water.
   a. Procurement of well equipment.
   b. Well drilling and completion.
3. Documentation of blowout control equipment configuration and procedures used on all floating drilling vessels capable of drilling in deep water.
   a. Equipment configuration.
   b. Shut-in procedures.
   c. Start-up procedures.
   d. Pump-out procedures.
4. Experimental study of shut-in procedures for blowout control on floating drilling vessels in deep water.

a. Experimental determination of frictional area coefficient profile of modern adjustable chokes and HCR valves used in blowout control operations.

b. Experimental determination of frictional area coefficient profile of modern annular blowout preventers during closure.

c. Development of mathematical model of pressure surges occurring during well closure.

d. Experimental evaluation of pressure surge model.

5. Experimental study of procedures for handling upward gas migration during the shut-in period.

a. Evaluation of conventional approach requiring use of surface drill pipe pressure.

b. Evaluation of volumetric methods.

c. Laboratory investigation of gas bubble fragmentation while rising in a static annulus.

d. Development of mathematical model of well behavior during shut-in period following a gas kick.

e. Determination of optimal method of handling upward gas migration during shut-in period.

6. Experimental study of start-up procedures for blowout control on floating drilling vessels in deep water.

a. Evaluation of present day start-up procedures which use existing equipment.

b. Evaluation of possible future start-up procedures which would require development of new equipment.

7. Experimental study of pump-out procedures for blowout control operations on a floating drilling vessel in deep water.

   a. Evaluation of present day pump-out procedures which use existing equipment.

   b. Evaluation of present day pump-out procedures which would require development of new equipment.

ACCOMPLISHMENTS

Task 1, well scaling and design, has been completed. Details of the design of both the well and the related surface equipment were presented in our last annual report.

Funding approval for Task 2a was received in September, 1980, and funding approval for Task 2b was received in October, 1980. Construction work has been proceeding rapidly since October, 1980. A workover rig was moved on location in late December, and well completion operations were conducted according to plans. The subsurface well work was completed January 15, 1981, and the workover rig was released. Some last-minute design changes were required in order to land the three strings of tubing at the surface in sufficient tension to prevent movement of the landing seals in the top portion of the triple parallel flow tube during simulated pressure control operations. However, all design changes can be made without the use of a workover rig. Considerable progress was also made on the installation of surface equipment.

Data collection for Tasks 3, 4a, 4b, and 5 are all essentially complete. However, written documentation of these tasks is still in progress. Three Master of Science (MS) theses dealing with these tasks are now in preparation.

Experimental work on Tasks 6 and 7 will begin as soon as the construction work (Task 2) is complete. This will probably be sometime in March, 1981. Experimental procedures for Tasks 6 and 7 are now being planned in more detail.

PROBLEMS

The only significant problem encountered since the last progress report was caused by the required change in the wellhead design. Since the required additional equipment is not available "off the shelf," the existing triple tree will have to be modified in a local machine shop. It is hoped that this additional expense will be offset by the salvage value of 3000 ft of casing recovered from the LSU-Goldking No. 1 well during the well workover.

A second problem has developed because of the resignation of Professor B. R. Hise from the Petroleum Engineering faculty to work as an oil and gas consultant in Baton Rouge. Mr. Hise was one of the three key personnel listed as essential to the research. We have not received approval of our proposed solution to this problem made in our previous progress report of December 1, 1980.

LISTED PROPERTY ACQUIRED

All of the items listed under Sections C1, C2, C3, and C4 on pages 12 and 13 of the contract have now been received and installed in the LSU-Goldking No. 1 well.

SIGNIFICANT CHANGES

No additional changes in the project are felt to be desirable at this time.

Current Status of New Research Well Facility